DIVISION OF ENVIRONMENT
QUALITY MANAGEMENT PLAN

PART III:

AMBIENT AIR CRITERIA POLLUTANTS MONITORING PROGRAM
QUALITY ASSURANCE PROGRAM PLAN

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation
Air Monitoring Services Section
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Section 1

OVERVIEW

1.1 Purpose and Scope

This document is the Ambient Air Criteria Pollutant Monitoring Program (AACPMP) Quality Assurance Program Plan (QAPP), administered by the Air Quality Analysis Unit (AQAU) and the Quality Assurance/Training Unit of the Air Monitoring Services Section (AMSS), Bureau of Air and Radiation (BAR), Division of Environment, Kansas Department of Health and Environment (KDHE). The purpose of the QAPP is to define and document the quality assurance (QA) and quality control (QC) activities of the program and ensure the validity of all data produced in the course of operations. Where applicable, this QAPP references the AMSS Ambient Air Monitoring Standard Operating Procedures (AAM SOP).

The provisions of this QAPP apply to ambient air criteria pollutant monitoring conducted by AMSS. The QAPP also applies to criteria pollutant monitoring performed by four local health/environment departments which submit data to AMSS for review and forwarding to the United States Environmental Protection Agency (EPA).

1.2 Developmental History of Plan

On May 10, 1979, EPA promulgated regulations in 40 CFR 58 that specified monitoring requirements for State Implementation Plans (SIPs). These regulations also set forth requirements made in response to Section 319 of the Clean Air Act Amendments of 1977 which required EPA to establish monitoring criteria to be applied uniformly across the nation, and to establish a national monitoring network. One of the requirements of the regulations is that organizations responsible for ambient air pollution monitoring must establish and maintain a viable QA/QC program. Appendix A of 40 CFR 58 describes such requirements for organizations responsible for SLAMS. Appendix B of 40 CFR 58 describes requirements for organizations responsible for prevention of significant deterioration (PSD) air monitoring. These requirements include development and implementation of policies, procedures, specifications, standards, and documentation necessary to (1) provide data of adequate quality to meet monitoring objectives and (2) minimize loss of air quality data due to malfunctions or out-of-control conditions.

The Air Monitoring Services Section has maintained an approved QA management plan and associated SOPs, in accordance with 40 CFR 58, since March 23, 1982. In 1995 revision and reformatting of the plan was carried out in compliance with an effort by the KDHE Division of Environment to consolidate program QA management plans and SOPs into a standard format. In 1999, a PM2.5 QAPP was written and approved by EPA for the commencement of a new statewide PM2.5 monitoring program. In 2000 this QAPP was written to replace the 1995 plan and the 1999 PM2.5 QAPP.

1.3 Historical Overview of Program

The Kansas ambient air quality monitoring program was initially authorized for implementation by KDHE (formerly the Kansas State Board of Health) with the enactment of K.S.A. 65-3001 *et seq.* by the 1967 Kansas legislature. The major provisions of these enabling statutes were adopted to simultaneously comply with the requirements of the federal Clean Air Act (42 U.S.C. 1857), which was subsequently amended in 1967, 1970, 1977 and 1990. This federal law establishes the requirements for states to implement approved air pollution control programs within their respective jurisdictions. The initial series of comprehensive air pollution control regulations implementing the Kansas Air Quality Act were promulgated in 1970 and codified in Article 19 of KDHE's administrative regulations (K.A.R. 28-19-1 *et seq.*). These original regulations have been amended and expanded since that time (most recently in 2000) in order to comply with relevant modifications to the federal requirements and to respond to changing needs within the state.

1.4 Operational Overview

The ambient air criteria pollutant monitoring program conducted by AMSS generates a large quantity of data from hourly (continuous) and daily (intermittent) monitoring instruments located across the state. The Kansas Ambient Air Monitoring Network and associated air quality surveillance activities are described in the State of Kansas Implementation Plan for the Attainment and Maintenance of National Air Quality Standards, Plan Revisions, Section E - Air Quality Surveillance. Air monitoring data obtained from AMSS activities are reported on a quarterly basis to the Aerometric Information Retrieval System (AIRS), a national database maintained by EPA.

Section 2

ORGANIZATIONAL DESCRIPTION

2.1 Organizational Charts

40 CFR Part 58 defines a State Agency as "the air pollution control agency primarily responsible for the development and implementation of a plan under the Act". Plan refers to the State Implementation Plan (SIP). The Act refers to the Clean Air Act. The Kansas Department of Health and Environment (KDHE) is the State Agency for Kansas.

40 CFR Part 58 defines the Local Agency as "any local government agency, other than the state agency, which is charged with the responsibility for carrying out a portion of the plan (SIP)". The following are the Local Agencies in Kansas:

Unified Government of Wyandotte County - Kansas City, Kansas (UGWC-KCK)
Johnson County Environmental Department (JCED)
Shawnee County Health Agency (SCHA)
Wichita-Sedgwick County Department of Community Health (W-SCDCH)

Figure 2.1 through 2.5 below represent the organizational structures of those portions of KDHE and the four local agencies which are responsible for the activities of the ambient air criteria pollutant monitoring program.

Kansas Department of Health and Environment

Division of Environment

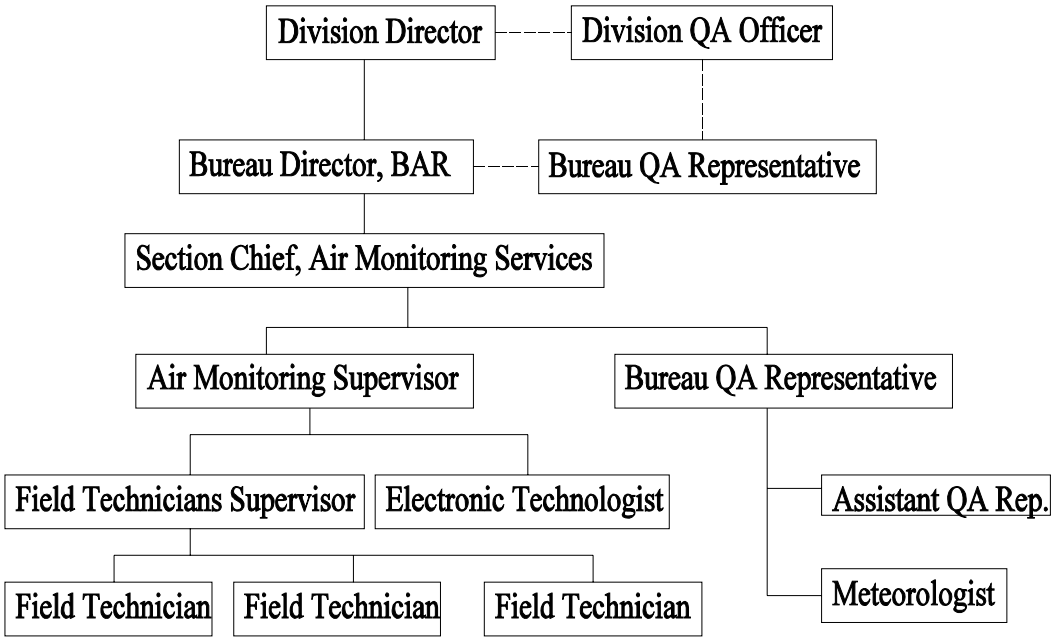

Figure 2.1

Shawnee County Health Agency

Figure 2.2

Johnson County Environment Department

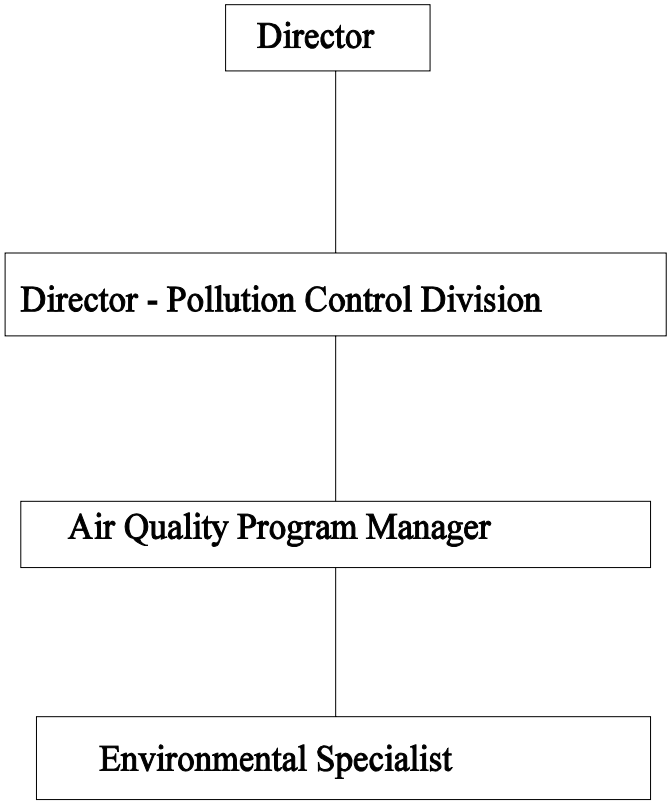

Figure 2.3

Wichita-Sedgwick County Department of Community Health

Environmental Health

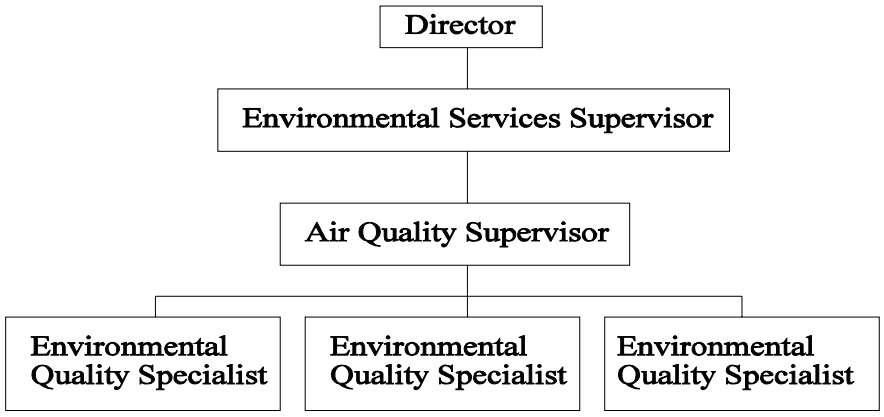

Figure 2.4

Unified Government of Wyandotte County - Kansas City, Kansas Department of Air Quality

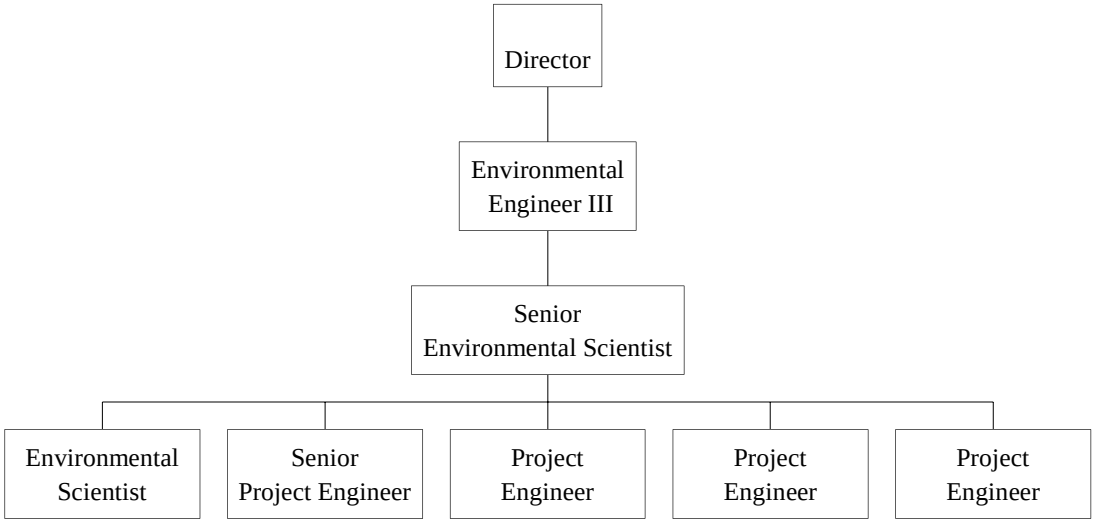

Figure 2.5

2.2 Individual Responsibilities of the Kansas Department of Health and Environment (KDHE)

The QA responsibilities of the **Division of Environment Director** and the **Division QA Officer** are described in the Division of Environment Quality Management Plan (QMP) Part I, Section 3.2.

The **Bureau Director** of the Bureau of Air and Radiation has overall responsibility for managing the Bureau of Air and Radiation (BAR) according to Division of Environment policy. The direct responsibility for assuring data quality rests with line management. Ultimately, the Bureau Director is responsible for establishing QA policy and for resolving QA issues identified through the QA program. Major QA related responsibilities of the Bureau Director include:

- approving the budget and planning processes
- assuring that the BAR develops and maintains a current and germane quality system
- assuring that the BAR develops and maintains current QAPPs and ensures adherence to the documents by staff, and where appropriate, other extramural cooperators
- establishing policies to ensure that QA requirements are incorporated into all environmental monitoring operations
- maintaining an active line of communication with the QA and technical managers

The Bureau Director delegates the responsibility of QA development and implementation in accordance with Division of Environment policy to the Section Chiefs.

The **Section Chief of the Air Monitoring Services Section** has overall responsibility for managing the Air Monitoring Services Section of the Bureau of Air and Radiation (BAR) according to BAR policy. The direct responsibility for assuring data quality rests with line management. The Section Chief is responsible for establishing QA policy and for resolving QA issues identified through the QA program. Major QA related responsibilities of the Section Chief include:

- participating in the budget and planning processes
- assuring that the Section develops and maintains a current and germane quality system
- assuring that the Section develops and maintains current QAPPs and ensures adherence to the document by staff, and where appropriate, other extramural cooperators
- carrying out policies to ensure that QA requirements are incorporated into all environmental monitoring operations
- maintaining an active line of communication with the QA and technical managers

- communication with EPA Project Officers and EPA QA personnel on issues related to routine sampling and QA activities
- understanding EPA monitoring and QA regulations and guidance, and ensuring subordinates understand and follow these regulations and guidance
- understanding KDHE QA policy and ensuring subordinates understand and follow the policy
- understanding and ensuring adherence to the QAPPs
- reviewing acquisition packages (contracts, grants, cooperative agreements, inter-agency agreements) to determine the necessary QA requirements.

- reviewing and approving QAPPs for the Ambient Air Monitoring Program
- developing budgets and providing program costs necessary for EPA allocation activities
- ensuring that all personnel involved in environmental data collection have access to any training or QA information needed to be knowledgeable in QA requirements, protocols, and technology
- recommending required management-level corrective actions

The Section Chief delegates the responsibility of QA development and implementation in accordance with BAR policy to those in the Air Monitoring Services Section

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The Bureau QA Representitive (BQAR) of the Air Monitoring Services Section is the official staff QA contact appointed by the Bureau Director. The BQAR reviews and approves all QAPPs within the bureau. The BQAR is responsible for the QA aspects of the Ambient Air Quality Monitoring Program. The BQAR's responsibilities include:

- remaining current on KDHE/Division of Environment QA policy and general and specific EPA QA policies and regulations as it relates to the Ambient Air Quality Monitoring Program
- developing, reviewing and approving QAPPs for the Ambient Air Monitoring Program
- responding to technical systems audits conducted by EPA
- reviewing precision and bias data
- providing QA training to technical staff of the section
- reviewing air monitoring standard operating procedures (SOPs).
- ensuring timely follow-up and corrective actions resulting from auditing and evaluation activities.
- verifying that the measurement quality standards are met as stated in the QAPPs
- coordinating QA activities with the Divisional QA Officer

The BQAR is also responsible for coordinating the data management activities of the ambient air monitoring program. These responsibilities of the BQAR include ensuring that data and information collected for the air monitoring program are properly captured, stored, and transmitted for use by program participants. The BQAR also provides data reports, calculations, and charts as requested. Responsibilities include:

- developing data management standard operating procedures
- ensuring that information management activities are developed within reasonable time frames for review and approval
- following good automated data processes
- coordinating the development of the information management system with data users
- ensuring the development of data standards for data structure, entry, transfer, and archive
- ensuring the adherence to the QAPPs where applicable
- ensuring access to data for timely reporting and interpretation processes
- ensuring the development of data base guides (data base structures, user guidance documents)

- ensuring timely delivery of all required data to the EPA-AIRS system
- determining appropriate exceptional event or validity flags in EPA-AIRS

The **Quality Assurance Assistant** (QAA) aids the BQAR in his/her responsibilities (see above). The QAA is also responsible for providing training related to QA/QC to the BAR.

The **Meteorologist** acquires and manages meteorological data from 29 weather stations in and around Kansas. He/she analyzes air pollution data with respect to meteorological data. This analysis includes study of long range transport and local sources of air pollution. The meteorologist coordinates and edits the Annual Report for distribution to the public.

The **Air Monitoring Supervisor** (AMS) directs the activities of the Air Quality Monitoring Unit (AQMU). The AQMU is responsible for carrying out air monitoring and ensuring the data quality results of the air monitoring by adhering to guidance and protocol specified by the QAPPs and SOPs for the field activities. Responsibilities of the AMS include:

- participating in the development and implementation of QAPPs.
- participating in training and certification activities as trainer and trainee.
- participating in the development of data quality requirements (overall and field) with the Bureau QA Representative
- participating in the development of standard operating procedures (SOPs)
- verifying that all required QA/QC activities are performed
- ensuring that all manufacturer's operating guidelines are followed
- ensuring that preventative maintenance is performed and documented
- ensuring that deviations from established procedures and methods are documented
- reporting all problems and corrective actions to the Bureau QA Representative
- reporting observed field/handling conditions which might influence data validity to the Bureau QA Representative
- preparing and delivering field data to the Bureau QA Representative
- supervise ozone mapping system (OMS)

The AMS prepares and negotiates the contract with the laboratory for $PM_{2.5}$ analysis. The AMS is also the point of contact with the PM2.5 Laboratory.

The **Field Technicians Supervisor** (FTS) supervises the field technicians who are responsible for carrying out air monitoring and ensuring the data quality results of the air monitoring by adhering to guidance and protocol specified by the QAPPs and SOPs for the field activities. Responsibilities include:

- technical review and implementation of the QAPPs
- participating in training and certification activities
- participate in the development and modification of standard operating procedures (SOPs)
- verifying that all required QA/QC activities are performed as required in the QAPPs

- ensuring that all manufacturer's operating guidelines are followed
- ensuring that preventive maintenance is performed and documented
- documenting deviations from established procedures and methods
- reporting all problems and corrective actions to the AMS
- reporting observed field/handling conditions which might influence data validity
- preparing and delivering field data to the Bureau QA Representative or AMS
- shipping/receiving equipment and filters according to the QAPPs
- supervise ozone mapping system (OMS)

The **three Field Technicians** are responsible for carrying out air monitoring and ensuring the data quality results of the air monitoring by adhering to guidance and protocol specified by the QAPPs and SOPs for the field activities. Responsibilities include:

- technical review and implementation of the QAPPs
- participating in training and certification activities
- participate in the development and modification of standard operating procedures (SOPs)
- perform all required QA/QC activities as required in the QAPPs
- follow all manufacturer's operating guidelines
- performing and documenting preventive maintenance
- documenting deviations from established procedures and methods
- reporting all problems and corrective actions to the FTS
- reporting observed field/handling conditions which might influence data validity
- preparing and delivering field data to the Bureau QA Representative or AMS
- shipping/receiving equipment and filters according to the QAPPs
- provide operational training and technical assistance to local agencies
- participate in the ozone mapping system (OMS)

The **Electronic Technologist** provides electronic repair for the Bureau of Air and Radiation. This position also downloads (via satellite downlink) videos of QA/QC related training and information.

2.3 Individual Responsibilities of the Shawnee County Health Agency

The **Health Department Administrator** (HDA) functions as the chief administrative officer of the Shawnee County Health Agency.

The **Environmental Health Director** (EHD) is responsible for the management of all environmental health programs of the Shawnee County Health Agency.

The **Environmental Health Specialist II** (EHS II) supervises the air monitoring done by the Shawnee County Health Agency. The EHS II reports all problems and corrective actions to KDHE.

The **Environmental Health Specialist I** (EHS I) is responsible for carrying out air monitoring

and ensuring the data quality results of the air monitoring by adhering to guidance and protocol specified by the QAPPs and SOPs for the field activities. Responsibilities include:

- technical review and implementation of the QAPPs
- participating in training and certification activities
- participate in the development and modification of standard operating procedures (SOPs)
- perform all required QA/QC activities as required in the QAPPs
- follow all manufacturer's operating guidelines
- performing and documenting preventive maintenance
- documenting deviations from established procedures and methods
- reporting all problems and corrective actions to the EHS II
- reporting observed field/handling conditions which might influence data validity
- preparing and delivering field data to the Bureau QA Representative or AMS
- shipping/receiving equipment and filters according to the QAPPs

2.4 Individual Responsibilities of the Unified Government of Wyandotte County - Kansas City, Kansas

The **Director Department of Air Quality** (DDAQ) is the chief administrator of the Department of Air Quality of the Unified Government of Wyandotte County - Kansas City, Kansas.

The **Environmental Engineer III** assists the DDAQ in his duties.

The **Senior Environmental Scientist** (SES) supervises the air pollution activities (including air monitoring). The ES II reports any problems or corrective actions to KDHE.

The **Environmental Scientist** and **four Project Engineers** are responsible for carrying out air monitoring and ensuring the data quality results of the air monitoring by adhering to guidance and protocol specified by the QAPPs and SOPs for the field activities. Except for the Environmental Scientist, these people act in a backup role for air monitoring. Responsibilities include:

- technical review and implementation of the QAPPs
- participating in training and certification activities
- participate in the development and modification of standard operating procedures (SOPs)
- perform all required QA/QC activities as required in the QAPPs
- follow all manufacturer's operating guidelines
- performing and documenting preventive maintenance
- documenting deviations from established procedures and methods
- reporting all problems and corrective actions to the SES
- reporting observed field/handling conditions which might influence data validity
- preparing and delivering field data to the Bureau QA Representative or AMS
- shipping/receiving equipment and filters according to the QAPPs

2.5 Individual Responsibilities of the Wichita-Sedgwick County Department of Community Health

The **Environmental Health Director** is responsible for all aspects of environmental health of the Wichita-Sedgwick County Department of Community Health.

The **Environmental Services Supervisor** supervises work in the administration of environmental services, including, but not limited to, air quality, public health sanitation, animal control, food inspection, adult care, vector control, and/or hazardous waste programs.

The **Air Quality Program Supervisor** (AQPS) is responsible for planning, coordinating and supervising a comprehensive program of air pollution prevention and control, including participation in the inspection, surveillance and eradication of sources of air pollution. The AQPS will report any problems or corrective actions to KDHE.

The **three Environmental Quality Specialists** (EQS) are responsible for carrying out air monitoring and ensuring the data quality results of the air monitoring by adhering to guidance and protocol specified by the QAPPs and SOPs for the field activities. Responsibilities include:

- technical review and implementation of the QAPPs
- participating in training and certification activities
- participate in the development and modification of standard operating procedures (SOPs)
- perform all required QA/QC activities as required in the QAPPs
- follow all manufacturer's operating guidelines
- performing and documenting preventive maintenance
- documenting deviations from established procedures and methods
- reporting all problems and corrective actions to the AQPS
- reporting observed field/handling conditions which might influence data validity
- preparing and delivering field data to the Bureau QA Representative or AMS
- shipping/receiving equipment and filters according to the QAPPs

2.6 Individual Responsibilities of the Johnson County Environmental Department (JCED)

The **Director of JCED** contributes to the overall protection of the County's environment and environmental health of citizenry by directing the Pollution Control, Laboratory, and Sanitation Divisions providing programs in the general areas of solid waste, water and air quality, chemical management, laboratory analysis, food service, public bathing safety, and private on-site sewage disposal.

The **Pollution Control Division Director** administers environmental regulatory programs and environmental service programs to protect the integrity of the County's environment for the benefit of its citizens and to enhance community awareness of environmental protection.

The **Air Quality Program Manager** (AQPM) supervises the operation and collection of data

from field monitors. The AQPM will report any problems or corrective actions to KDHE.

The **Environmental Specialist** (ES) is responsible for carrying out a required task(s) and ensuring the data quality results of the task(s) by adhering to guidance and protocol specified by the QAPPs and SOPs for the field activities. Responsibilities include:

- technical review and implementation of the QAPPs
- participating in training and certification activities
- participate in the development and modification of standard operating procedures (SOPs)
- perform all required QA/QC activities as required in the QAPPs
- follow all manufacturer's operating guidelines
- performing and documenting preventive maintenance
- documenting deviations from established procedures and methods
- reporting all problems and corrective actions to the AQPM
- reporting observed field/handling conditions which might influence data validity
- preparing and delivering field data to the Bureau QA Representative or AMS
- shipping/receiving equipment and filters according to the QAPPs

2.7 Distribution

This document, the Ambient Air Criteria Pollutant Monitoring QAPP and any revisions will be distributed to the following entities. It will also be available on the KDHE QA website.

KDHE Division of Environment QA Officer
KDHE Bureau of Air and Radiation (BAR) QA Representative
KDHE BAR Air Monitoring Services Section (AMSS) Section Chief
KDHE BAR AMSS Air Monitoring Supervisor
KDHE BAR AMSS Field Technicians Supervisor
KDHE BAR AMSS Field Technicians (three of them)
KDHE BAR AMSS Assistant Bureau QA Representative
KDHE BAR AMSS Meteorologist
Shawnee County Health Agency
Johnson County Environmental Department
Wichita-Sedgwick County Department of Community Health, Environmental Health
Unified Government of Wyandotte County - Kansas City, Kansas, Department of Air Quality
United States Environmental Protection Agency, Region 7

Section 3

DATA PERFORMANCE CRITERIA

This section provides a description of data performance criteria expressed in terms of data precision, accuracy, completeness, comparability and representativeness for each parameter of interest.

3.1 Precision

Precision is defined as the level of agreement among individual measurements of the same property, conducted under identical or similar conditions. The precision of each monitor is found in the following manner.

3.1.1 PM2.5/PM10 Intermittent Monitoring

25% of the PM2.5 monitors and 25% of the PM10 monitors are collocated. Collocated monitors are those which measure the same parameter and run simultaneously every six days at the same site. See the document Ambient Air Monitoring Standard Operating Procedures (AAM SOP) Sections 2 and 9 for the details of this procedure.

Each PM2.5 monitor is given a flow check at the normal flow rate of the monitor, a temperature sensor check, and a barometric pressure sensor check. These checks are called verifications and are performed each month by the operator of the monitor. See AAM SOP Section 9 for the details of this procedure.

3.1.2 PM2.5/PM10 Continuous Monitoring

Every two weeks a flow check is performed at the normal flow rate of the monitor. See AAM SOP Section 16 for details of this procedure.

3.1.3 O3, SO2, and NO2

Every two weeks, the monitors are exposed to a known concentration from 0.08 to 0.10 parts per million (ppm). The known concentration and the monitor reading are recorded. See AAM SOP Section 1 for details of this procedure.

3.1.4 CO

Every two weeks, the monitors are exposed to a known concentration from 8 to 10 parts per million (ppm). The known concentration and the monitor reading are recorded. See Section 1 of AAM SOP for details of this procedure.

3.1.5 Evaluation of precision

In the case of filter monitors, precision is evaluated by calculating the percent difference between the collocated readings. In the case of continuous monitors, precision is evaluated by calculating the percent difference between the known reading and the monitor reading. An absolute value of the percent difference (APD) of more than 15% indicates a problem. An exception to this is with collocated concentrations which are low. That is, where either collocated PM2.5 concentration is less than 7 ug/m3, an APD of more than 15% is not considered a problem. Also, where either collocated PM10 or collocated TSP concentration is less than 21 ug/m3, an APD of more than 15% is not considered a problem.

The problem situations will be examined and a solution will be found to correct the problem. All precision results (except PM2.5 verifications) will be reported to EPA-AIRS on a quarterly basis (within 90 days of the end of the calendar quarter). See AAM SOP Section 4 for details of this procedure.

3.2 Accuracy

Accuracy is defined as the extent to which a measured value actually represents the condition being measured. Accuracy is influenced by the degree of random error (precision) and systematic error (bias) inherent in the measurement operation (e.g., environmental sampling and analytical operations). The accuracy of each monitor is found in the following manner.

3.2.1 PM2.5 Intermittent Samplers

Single point flow audits will be conducted on each monitor during each calendar quarter. The flow standard used for the audit will be different than the flow standard used for calibration of the monitor. See Section 9 of AAM SOP for details of this procedure.

Each year, EPA will choose 25% of the monitors to perform collocated reference method (FRM) audits on. Each of the 25% will be audited by EPA (or its contractor) four days during the year.

3.2.2 PM10 Intermittent Samplers

At least 25% of the monitors will be audited with a single point flow check each calendar quarter. Each monitor will be audited at least once a year. The flow standard used for the audit will be different than the flow standard used for calibration of the monitor. See AAM SOP Section 2 for details of this procedure.

3.2.3 PM2.5/PM10 Continuous Monitors

At least 25% of the monitors will be audited with a single point flow check each calendar quarter. Each monitor will be audited at least once a year. The flow standard used for the audit will be

different than the flow standard used for calibration of the monitor. See AAM SOP Section 16 for details of this procedure.

3.2.4 O3, SO2, and NO2 Monitors

For each pollutant, at least one and at least 25% of the monitors will be audited at three known concentrations (0.03 to 0.08 ppm, 0.15 to 0.20 ppm, and 0.35 to 0.45 ppm) each calendar quarter. Each monitor will be audited at least once a year. The gaseous standards used for the audit will be different than the gaseous standards used for calibrations of the monitor. See AAM SOP Section 1 for details of this procedure.

3.2.5 CO Monitors

At least one and at least 25% of the monitors will be audited at three known concentrations (3 to 8 ppm, 15 to 20 ppm, and 35 to 45 ppm) each calendar quarter. Each monitor will be audited at least once a year. The gaseous standards used for the audit will be different than the gaseous standards used for calibrations of the monitor. See AAM SOP Section 1 for details of this procedure.

3.2.6 Evaluation of accuracy

Accuracy of the monitors is evaluated by calculating the absolute value of the percent difference (APD) between the known concentration or known flow and the monitor reading. For flow audits on PM2.5 intermittent samplers, an APD of greater than 4% indicates a problem. For flow audits of PM10 intermittent samplers and TSP intermittent samplers, an APD of greater than 10% indicates a problem. For other monitors, an APD of greater than 15% indicates a problem.

The problem situations will be examined and a solution will be found to correct the problem. All accuracy results (except collocated PM2.5 FRM audits) will be reported to EPA-AIRS on a quarterly basis (within 90 days of the end of the calendar quarter). See AAM SOP Section 4 for details of this procedure.

3.3 Completeness

Completeness is defined as a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions.

Our minimum requirement is 75% valid data at each monitor per calendar quarter. Our goal is 100% valid data at each monitor per calendar quarter. The percentage valid is based on only those days which are planned to be monitored. In the case of particulate matter monitoring which is scheduled for less then every day sampling, monitoring on a non-scheduled day does not count as valid when calculating the percent valid.

3.4 Comparability

Comparability is defined as a measure of the confidence with which one item (e.g., data set) can be compared to another. We achieve comparability by using methodology which has been approved by EPA. Specifically, EPA has established certain monitoring equipment as reference or equivalent methods (REM). Unless the monitored parameter has no REM, we use the REM for monitoring.

3.5 Representativeness

Representativeness is defined as a measure of the degree to which data accurately and precisely represent a selected characteristic of a monitored system. Representativeness is achieved through the precision and accuracy procedures described above in sections 3.1 and 3.2 respectively.

KDHE also achieves representativeness by following 40 CFR Part 58, Appendix D (Network Design for State and Local Air Monitoring Stations (SLAMS), National Air Monitoring Stations (NAMS), and Photochemical Assessment Monitoring Stations (PAMS)) and 40 CFR Part 58, Appendix E (Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring).

Each monitor operated by KDHE is assigned a scale of representativeness based on the definitions of 40 CFR Part 58, Appendix D. *Microscale* defines the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters. *Middle Scale* defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer. *Neighborhood Scale* defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range. *Urban Scale* defines the overall, citywide conditions with dimensions on the order of 4 to 50 kilometers. This scale would usually require more than one site for definition. *Regional Scale* defines usually a rural area of reasonably homogeneous geography and extends for tens to hundreds of kilometers.

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Section 4

NETWORK DESCRIPTION

4.1 Purpose

The purpose of this section to provide a description of, and rationale for, intended sampling frequency, sampling network design and monitoring site selection criteria.

The primary purpose of the KDHE air monitoring program is to measure compliance with the National Ambient Air Quality Standards (NAAQS). Other purposes include determining trends over time, determining effects on air quality from adjustments to source emissions, developing algorithms based on historical air quality and other conditions which will forecast air quality, verifying air quality modeling programs, providing real-time ozone data to the public, and correlating health effects to air quality.

Sampling network design and monitoring site selection comply with the following Appendices to 40 CFR Part 58:

(1) 40 CFR 58, Appendix A contains QA criteria;

(2) 40 CFR 58, Appendix D contains criteria for network design; and

(3) 40 CFR 58, Appendix E contains criteria for siting of instruments and/or instrument probes.

4.2 Sampling Frequency

Minimum sampling frequencies are established by EPA and followed accordingly. The sampling frequency of the KDHE monitors is based on EPA's requirement. In the cases of every third and sixth day sampling, specific days must be sampled in order that the entire nation is sampling on the same day. This intermittent sampling is accomplished in accordance with a national sampling schedule published annually by EPA.

4.3 Site Selection

The selection of a specific monitoring site includes the following activities:

1) developing and understanding the monitoring objective and appropriate data quality objectives;

2) identifying the spatial scale most appropriate for the monitoring objective of the site;

3) identifying general potential locations where the monitoring site could be placed; and

4) identifying the specific monitoring site.

4.4 Monitoring Objectives and Spatial Scales

The criteria pollutant component of the Kansas Ambient Air Monitoring Network is designed to determine one of six monitoring objectives:

1) highest concentrations expected to occur in the area covered by the network;

2) representative concentrations in areas of high population density;

3) impact on ambient air pollution of significant sources;

4) general background concentration levels;

5) extent of regional pollutant transport among populated areas, and in support of secondary standards; and

6) welfare-related impacts in rural and relatively remote areas.

Each monitor within the Kansas Ambient Air Monitoring Network (see tables below) is assigned one of the following monitoring objective designations:

Population exposure	The monitor located in an area associated with high population density.
Background	The monitor is located where manmade pollutant emissions are minimal.
Precision	This monitor is collocated for quality control purposes, i.e., to provide duplicate data for the evaluation of measurement precision.
Transport	The monitor is located to measure pollutants transported from other areas.
Maximum concentration	The monitor is located where a high concentration of the pollutant is expected (often based on results of receptor models).
Comparison study	The monitor is located adjacent to other instrumentation measuring the same pollutant to compare different sampling/monitoring methodologies.
AQI	The monitor provides data primarily for reporting the Air Quality Index (previously called the Pollutant Standards Index).

Data collected within the network must be representative of the spatial area under study. The goal in siting a monitoring station is to match the spatial scale represented by the samples obtained with the spatial scale most appropriate for the monitoring objective of the station. For a description of representative measurement scales, see section 3.5 above.

4.5 Site Location

Four criteria should be considered when evaluating potential sites. Monitoring sites should be oriented to measure the following (singly or in combination as appropriate for the sampling objective):

1) impacts of known pollutant emission categories on air quality;

2) population density relative to receptor-dose levels, both short- and long-term;

3) impacts of known pollutant emission sources (area and point) on air quality; and

4) representative air quality.

Selection according to these criteria requires detailed information concerning the location of sources, geographical variability of ambient pollutant concentrations, meteorological conditions and population density. Selection of the number, geographic locations, and types of sampling stations is, therefore, a complex process.

The sampling site selection process also involves consideration of the following factors:

Economics The level of resources required for all data collection activity. This includes instrumentation, installation, maintenance, data retrieval, data analysis, quality assurance and data interpretation.

Security In some cases, a particular site may have associated problems which compromise the security of monitoring equipment (i.e., high risk of theft, vandalism, etc.). If such problems cannot be remedied through the use of standard measures such as additional lighting, fencing, etc., then an attempt to locate the site as near to the preferred location shall be made.

Logistics This process includes procurement, maintenance and transportation of material and personnel for the monitoring operation. The logistics process requires full knowledge of all aspects of the data collection operation: planning, reconnaissance, training, scheduling, safety, staffing, procurement of goods and services, communications, and inventory management.

Atmospheric considerations These may include spatial and temporal variability of pollutants and their transport. Effects of buildings, terrain, and heat sources or sinks on air trajectories can produce localized anomalies of pollutant concentrations. Meteorology must be considered in determining the geographic location of a site as well as the height, direction and extension of sampling probes. Evaluation of a local wind rose is essential to proper location of many monitoring sites (e.g., siting either to detect or avoid emissions from specific sources).

Diffusion and transport of air pollutants are affected by topographic features. Minor features may exert small influences, and major features (e.g., deep river valleys or mountain ranges) can affect large areas. A review of topography should be conducted prior to final site selection to ensure that data collection will not be adversely affected.

4.6 Monitor Placement

Final placement of a particular monitor at a selected site is dependent on physical obstructions and activities in the immediate area. The availability of utilities (i.e., electricity and telephone services) is critical. Monitors must be placed away from obstructions such as trees and fences in order to avoid their effects on air flow. To prevent sampling bias, air flow around the monitor sampling probe must be representative of the general air flow in the area.

The placement of each monitor is generally determined by the defined monitoring objective. Monitors are thus usually placed according to potential exposure to pollution. Due to the various factors discussed above, tradeoffs are often necessary to locate a site for collection of optimally representative data.

Below, are tables which provide a description of the KDHE ambient air monitoring network.

TABLE 1

KANSAS AMBIENT AIR MONITORING NETWORK

PARTICULATE MONITORING NETWORK

Monitor Type	AIRS I.D.	City or County	Pollutant	Operating Schedule	Monitoring Objective	Spatial Scale
SLAMS	091-0007	Overland Park	PM2.5	3 day	Population exposure	Neighborhood
COLO.	091-0007	Overland Park	PM2.5	6 day	Precision	Neighborhood
SLAMS	091-0008	Overland Park	PM2.5	3 day	Population exposure	Neighborhood
SLAMS	091-0009	Olathe	PM2.5	3 day	Population exposure	Neighborhood
SLAMS	107-0002	Linn Co.	PM2.5	3 day	Transport	Regional
COLO.	107-0002	Linn Co.	PM2.5	6 day	Precision	Regional
SLAMS	173-0008	Wichita	PM2.5	3 day	Population exposure	Neighborhood
SLAMS	173-0009	Wichita	PM2.5	3 day	Population exposure	Neighborhood
SLAMS	173-0007	Wichita	PM10	6 day	Population exposure	Neighborhood
SLAMS	173-0008	Wichita	PM10	3 day	Population exposure	Neighborhood
SLAMS	173-0009	Wichita	cPM10	Daily	Population exposure	Neighborhood
SLAMS	177-0010	Topeka	PM2.5	3 day	Population exposure	Neighborhood
SLAMS	177-0011	Topeka	PM2.5	3 day	Population exposure	Neighborhood
SLAMS	191-0002	Peck	PM2.5	3 day	Transport	Regional

cPM - Continuous

TABLE 1 (Continued)

Monitor Type	AIRS I.D.	City or County	Pollutant	Operating Schedule	Monitoring Objective	Spatial Scale
SPM	195-0001	Trego Co.	cPM2.5	Daily	Background	Regional
SLAMS	209-0022	Kansas City	PM2.5	3 day	Population exposure	Neighborhood
CORE	173-0010	Wichita	PM2.5	3 day	Population exposure	Neighborhood
COLO.	173-0010	Wichita	PM2.5	6 day	Precision	Neighborhood
CORE	209-0021	Kansas City	PM2.5	3 day	Population exposure	Neighborhood
COLO.	209-0021	Kansas City	PM2.5	6 day	Precision	Neighborhood
NAMS	173-1012	Wichita	cPM10	Daily	Maximum concentration	Neighborhood
COLO.	173-1012	Wichita	PM10	6 day	Precision	Neighborhood
NAMS	209-0015	Kansas City	PM10	6 day	Population exposure	Neighborhood
NAMS	209-0020	Kansas City	PM10	6day	Maximum concentration	Neighborhood
SPM	057-0001	Dodge City	PM10	6 day	Population exposure	Neighborhood
SPM	107-0002	Linn County	cPM2.5	Daily	Comparison Study	Regional
SPM	125-0006	Coffeyville	cPM10	Daily	Population exposure	Neighborhood
SPM	133-0002	Chanute	PM10	6 day	Population exposure	Neighborhood
SPM	173-0010	Wichita	cPM10	Daily	AQI	Neighborhood
SPM	177-0010	Topeka	PM10	6 day	Population exposure	Neighborhood
SPM	209-0021	Kansas City	cPM2.5	Daily	Comparison Study	Neighborhood

cPM - Continuous

TABLE 1 (Continued)

Monitor Type	AIRS I.D.	City or County	Pollutant	Operating Schedule	Monitoring Objective	Spatial Scale
SPM	177-0012	Topeka	PM2.5	3 day	Comparison Study	Neighborhood
SPM	177-0012	Topeka	cPM2.5	Daily	Comparison Study	Neighborhood
SPM	177-0012	Topeka	PM10	3 day	Comparison Study	Neighborhood
SPM	181-0001	Goodland	PM10	6 day	Population exposure	Neighborhood
SPM	133-0002	Chanute	TSP	6 day	Population exposure	Neighborhood

cPM - Continuous

TABLE 2

KANSAS AMBIENT AIR MONITORING NETWORK
GASEOUS MONITORING NETWORK

Monitor Type	AIRS I.D.	City or County	Pollutant	Operating Schedule	Monitoring Objective	Spatial Scale
SLAMS	173-0010	Wichita	CO	Hourly	Population exposure	Neighborhood
SLAMS (Remove?)	173-1003	Wichita	CO	Hourly	Population exposure	Middle scale
SLAMS	209-0021	Kansas City	CO	Hourly	Population exposure	Middle scale
SLAMS	091-????	Johnson Co.	O3	Hourly	Population exposure	Neighborhood
SLAMS	209-0021	Kansas City	O3	Hourly	Population exposure	Neighborhood
NAMS	173-0001	Sedgwick Co.	O3	Hourly	Maximum concentration	Urban
NAMS	173-0010	Wichita	O3	Hourly	Population exposure	Neighborhood
NAMS	209-0021	Kansas City	SO2	Hourly	Population exposure	Neighborhood
SPM (SLAMS?)	173-1014	Wichita	CO	Hourly	Population exposure	Neighborhood
SPM	107-0002	Linn Co.	CO	Hourly	Transport	Regional
SPM	191-0002	Peck	CO	Hourly	Transport	Regional
SPM	195-0001	Trego Co.	CO	Hourly	Background	Regional
SPM	107-0002	Linn Co.	O3	Hourly	Transport	Regional

TABLE 2 (Continued)

Monitor Type	AIRS I.D.	City or County	Pollutant	Operating Schedule	Monitoring Objective	Spatial Scale
SPM	173-????	Wichita	O3	Hourly	Population exposure	Neighborhood
SPM	191-0002	Peck	O3	Hourly	Transport	Regional
SPM	195-0001	Trego Co.	O3	Hourly	Background	Regional
SPM	107-0002	Linn Co.	SO2	Hourly	Transport	Regional
SPM	125-0006	Coffeyville	SO2	Hourly	Population exposure	Neighborhood
SPM	191-0002	Peck	SO2	Hourly	Transport	Regional
SPM	195-0001	Trego Co.	SO2	Hourly	Background	Regional
SPM	107-0002	Linn Co.	NO2	Hourly	Transport	Regional
SPM	173-????	Wichita	NO2	Hourly	Population exposure	Neighborhood
SPM	191-0002	Peck	NO2	Hourly	Transport	Regional
SPM	195-0001	Trego Co.	NO2	Hourly	Background	Regional
SPM	209-0021	Kansas City	NO2	Hourly	Population exposure	Neighborhood

? Installation of monitors not completed as of 31 October 2000.

TABLE 3
KANSAS SITE LOCATIONS

AIRS	City or County	Location	Address	Latitude/ Longitude
057-0001	Dodge City	Pump Station	2100 1st Ave.	37:46:19N/100:01:04W
091-0007	Overland Park	Johnson Co. Justice Center	85th & Antioch	38:58:30N/094:41:07W
091-0008	Overland Park	Oxford Middle School	12500 Switzer	38:54:09N/094:42:21W
091-0009	Olathe	BlackBob Elem. School	14701 Brougham	38:51:43N/094:46:17W
091-????	Johnson Co.	?	?	?
107-0002	Linn Co.	Mine Creek Historic Site	7801 Scott Rd.	38:08:27N/094:43:51W
125-0006	Coffeyville	NE corner of Intersection	Union & E. North	37:02:49N/095:36:48W
133-0002	Chanute	KDHE SE Dist. Office	1500 W. 7th	37:40:34N/095:28:28W
173-0001	Sedgwick Co.	SG Co. Maint. Shop	200 E. 53rd North	37:46:53N/097:20:14W
173-0007	Wichita	Fire Station No. 7	St. Paul & 13th	37:42:32N/097:22:31W
173-0008	Wichita	Fire Station No. 11	G.Wash. Blvd. & Skinner	37:39:35N/097:17:50W
173-0009	Wichita	Fire Station No. 12	Glenn & Pawnee	37:39:04N/097:21:44W
173-0010	Wichita	Wichita-SG Co. Health Dept.	1900 E. 9th	37:42:04N/097:18:50W
173-1003	Wichita	Fire Station No. 2	Topeka & Lewis	37:40:51N/097:20:02W
173-1012	Wichita	Coleman Co.	3600 N. Hydraulic	37:44:50N/097:18:59W
173-1014	Wichita	One Main Place	Douglas & Main	37:41:15N/097:20:15W
177-0010	Topeka	Robinson Middle School	1125 W. 14th (14th & Clay)	39:02:25N/095:41:30W
177-0011	Topeka	McClure Elem. School	2529 SW Chelsea Dr.	39:01:17N/095:44:54W
177-0012	Topeka	Washburn University	SW Corner of Football Stadium	39:01:57N/095:42:04W
181-0001	Goodland	City Fire Station	1010 Center	39:20:54N/101:42:47W
191-0002	Peck	Peck Community Center	707 E. 119th S.	37:28:32N/097:22:00W
195-0001	Trego Co.	Cedar Bluff Reservoir	Cedar Bluff State Park	38:46:13N/099:45:49W
209-0015	Kansas City	Fire Station No. 3	420 Kansas	39:05:16N/094:37:17W
209-0020	Kansas City	Fairfax Fire Station	444 Kindelberger	39:09:05N/094:37:03W
209-0021	Kansas City	JFK Center	1210 N. 10th	39:07:03N/094:38:08W
209-0022	Kansas City	Highland Middle School	3101 S. 51st Street	39:02:45N/094:41:40W

Section 5

DESCRIPTION OF SAMPLING EQUIPMENT

5.1 Description of Sampling Equipment

Descriptions of the sampling equipment and associated decontamination procedures are provided in the Ambient Air Monitoring (AAM) SOP. If the pollutant monitored has United States Environmental Protection Agency Reference or Equivalent Methods (REM), then one of those REM will be used by KDHE for air monitoring.

Section 6

DESCRIPTION OF FIELD PROCEDURES

6.1 Description of Field Procedures

A description of field procedures, including sample collection, analysis, preservation, transport and chain-of-custody procedures and accompanying safety protocols are in the AAM SOP.

Section 7

LABORATORY PARAMETERS AND PROTOCOLS

7.1 PM2.5 Filter Analysis

PM2.5 filters will be weighed by a contract laboratory (CL) using a microbalance. Field operators will submit the air volume during sampling to the CL. The CL will calculate the resulting PM2.5 concentrations (in units of micrograms per cubic meter) and submit them to KDHE on a monthly basis. The CL will follow 40 CFR Part 50 and U.S. EPA Quality Assurance Guidance Document 2.12 (or equivalent, as approved by KDHE/BAR) in all of its activities. KDHE will conduct an annual laboratory inspection according to AAM SOP Section 9. Sample holding times and description of laboratory analytical and safety protocols will be included in the CL QAPP. The CL QAPP will be reviewed and approved by the air monitoring supervisor, the bureau quality assurance representative, and the air monitoring services section chief.

7.2 PM10 Filter Analysis

PM10 and TSP filters will be weighed by the KDHE Division of Health and Environment Laboratory (DHEL). Field operators will submit the air flow rate and elapsed time during sampling to DHEL. DHEL will calculate the resulting PM10 concentrations (in units of micrograms per cubic meter) and submit them to the Air Monitoring Services Section on a monthly basis. Sample holding times and description of laboratory analytical and safety protocols will be included in the DHEL document: Analytical Methods and Quality Assurance Guidelines for the Inorganic Chemistry Laboratory.

Section 8

DATA VALIDATION AND MANAGEMENT

This section provides a description of data validation, storage, transfer, reporting and backup requirements and any special documentation requirements.

8.1 Data Validation

Data validation involves using procedures to check that field and data processing operations have been carried out correctly. The data validation process finds data that are suspect. Then the verification process determines whether the data are valid, invalid, or valid with a flag. A more detailed description of the data validation procedures shown below can be found in Section 4 of the AAM SOP.

8.1.1 PM2.5 Intermittent Sampling

Operators send electronic downloaded filter and interval data to the QA unit. In the QA unit, these data are visually compared to the last transmittal to see if there are any missing data. If there are missing data, the operator is contacted to find out why and to take any corrective action. The volume, elapsed time, and flow rate are reviewed for validity. The site IDs are checked. The status codes should be 00000000 unless the sample was a field blank in which case the status codes are 00800000. An edit program is run on the filter data which checks for unusual values and any duplicate filter IDs. If there are any problems, the operator is contacted in order to determine the validity or take corrective action.

An edit/summary program is run on the downloaded interval data. Interval data have the ambient temperature, filter temperature, barometric pressure, and flow rate for every five minutes. This program points out any flows which are off by 5 percent for a five minute period. These PM2.5 concentrations are flagged by a W in the submittal to EPA-AIRS. There is an exception to this. If the monitor was put into audit mode (this would be indicated in the status codes and corroborated by QC records) during the sample day, this would cause a flow to be off by five percent. This would not cause a flag since it is not a malfunction of the monitor and does not introduce any error into the sample volume. The program also checks for any cases where the filter temperatures are higher than the ambient temperatures by five 5 degrees C average for a period of 30 minutes. These PM2.5 concentrations are flagged by an X in EPA-AIRS. Where the temperature differences occur on non-sampling days, there would be no flag if the filter had been removed prior to the temperature difference.

Besides the W and X flags described above, KDHE may also assign a Y flag. The Y flag is applicable if the elapsed sample time was less than 23 hours and the concentration (calculated by taking the net weight and dividing by the predicted volume (average flow rate times 1440)) is greater than 15.4 micrograms per cubic meter (ug/m3). If the resulting concentration is less than or equal 15.4, then the sample is invalid. If the resulting concentration is greater than 15.4 ug/m3,

then this concentration is reported with a flag of Y.

The contract laboratory assigns flags to PM2.5 data which are independent of the AIRS flags described above. These flags are described in the AAM SOP Appendix E.

8.1.2 PM10 Intermittent Monitoring

The field operators send in the filters with flow rate, elapsed time, the date, and the monitor ID. KDHE field technicians check these entries for validity. PM10 concentrations are sent by the DHEL laboratory to the Air Monitoring Services Section (AMSS). The QA unit check for any unusual values. The DHEL laboratory (upon request of the AMSS) then checks these unusual values for data entry errors.

8.1.3 Continuous (Gaseous and PM) Monitoring

Continuous data is recorded by the data loggers every hour. A field technician visually scans the data for unusual values. He/she investigates these to determine if they are valid. When corrections are needed, the field technician submits the corrections to the Bureau QA Representative in writing. After a quarter of data has been checked on the data computer, the data is copied to the Bureau QA Representative's (BQAR) computer.

Normally, the field technician disables the data logger channel when doing a quality control (QC) operation on a monitor. A primary concern is that the field technician might not disable the data logger channel and erroneous data would be recorded in the data logger. The BQAR runs a computer program which reads the data file containing QC operations. For the day of each QC operation, the program searches the continuous data and prints out the 24 readings. The BQAR checks the resulting listing to make sure that there is missing data at the time of the QC operation and no unusual values. BQAR also runs a program that prints the data with an asterisk after any reading that is high. These values are investigated to make sure they are valid.

8.1.4 Quality Control Data

The quality control data are entered into a Quattro Pro spread sheet by hand by the BQAR from field sheets. The BQAR assistant checks this data entry. The procedure above in section 8.1.3 also validates the QC data.

8.1.5 Submittal to EPA-AIRS

Before the data can be submitted to EPA-AIRS, an edit is run on the data by an EPA program. Any suspect values or errors indicated by this edit are investigated. Also, a Scan Report is run on AIRS. This also shows any unusual values (which are investigated). The Scan Report is needed because the AIRS edit does not completely check non-criteria pollutants.

8.1.6 Ozone Mapping System (OMS)

Ozone data is transmitted to the OMS on a real-time basis for display on the EPA AIRNOW web page. Quality assurance activities must be balanced against timeliness of reporting in the case of near real-time data provided to the public. These data are not given the normal data validation review as described above. Ozone data transferred to the OMS is subject to electronic review prior to transfer to the EPA AIRNOW web page as specified in AAM SOP Section 13. After receipt of OMS data, EPA also conducts a series of QA/QC checks (See section 13 of the AAM SOP). The OMS data is subject to a disclaimer statement since the level of quality assurance is less rigorous than that applied to data posted to the Aerometric Information Retrieval System (AIRS).

OMS data processing and management are generally accomplished via the Environmental Systems Corporation (ESC) OMS module. This software package has been specifically designed and tested for preparation of OMS data.

Data are subjected to the following steps:

1. Hourly ozone data are collected on a data logger.
2. Data logger reviews concentrations against trigger value.
3. If trigger value is exceeded, KDHE is notified. If trigger value is not exceeded, proceed to step 4.
   3a. Site and instrument conditions are evaluated to assure value. If value is accepted, proceed to step 4.
   3b. If value is not accepted, the upload is interrupted, and the bad data voided.

4. Data logger is polled on real time schedule to KDHE network computer.

5. Accepted OMS values are uploaded to OMS site.

Additional details of OMS are described in the AAM SOP Section 13.

8.2 Storage, Transfer, Reporting and Backup Requirements and Any Special Documentation Requirements

All the data are backed up on the local area network H: drive. All the data are transmitted via the internet to EPA-AIRS. Any data changes made to EPA-AIRS are documented in a paper file in the office of the BQAR. All computer programs will be tested initially, after any modifications to the program, whenever a problem is reported within the computational system, and at least every three years. All electronic data are archived on computer hard drive. Hard copy records are filed in the office for at least three years. After three years, they are transferred to the State of Kansas data archives. A more detailed description of the procedures shown below can be found in the AAM SOP Section 4.

8.2.1 PM2.5 Intermittent Data

Downloaded monitor data is E-mailed or sent via diskette to the BQAR computer by the field technicians. Each month these data are E-mailed by the BQAR to the contract laboratory (CL). Exposed filters are mailed by the field technicians to the CL. After weighing the filters and calculating the concentrations, the CL sends the results to the BQAR in electronic spread sheet format and AIRS format. The BQAR calculates averages and standard deviations and sends the electronic spread sheets to the operators and Air Monitoring Services Section personnel.

8.2.2 PM10 Intermittent Data

Envelopes (annotated with site ID, flow rate, elapsed time, the operator's initials, and the date of sampling) with enclosed filters are mailed (or hand-carried) by the operator to the Air Monitoring Services Section. These envelopes and filters are sent to the KDHE Division of Health and Environment Laboratories (DHEL). After weighing the filters and calculating the concentrations, the DHEL sends (via E-mail) the results to the BQAR.

8.2.3 Continuous Data

Data is automatically stored on a data logger at the site. The data computer in the Air Monitoring Services Section automatically polls the data loggers and stores the data on a daily basis. The data computer runs under the Environmental Services Corporation (ESC) Ambient Air Quality Data Acquisition Software (E-DAS). There may be some monitors that are not able to be polled. On these monitors, data is transmitted by E-mail or diskette. When a quarter of data has been loaded into E-DAS and reviewed by the operators, it is copied into the BQAR computer (E-DAS).

8.2.4 Quality Control Data

QC data is entered into a Quattro Pro spread sheet by hand by the BQAR from field sheets. These data are also stored as comma separated variable (CSV) text file which can be read by a BASIC program. This program reads the data and builds AIRS formatted records that can be submitted to EPA AIRS.

Section 9

EQUIPMENT CALIBRATION AND AUDITING

This section describes equipment testing, auditing, calibration, and preventive maintenance procedures. All actions performed according to this section will be recorded (as described in the AAM SOP) and submitted to the BQAR on a quarterly basis.

9.1 PM2.5 Intermittent Sampling

The Streamline flow transfer standards will be calibrated annually according to AAM SOP Section 10. The temperature transfer standards will be calibrated according to AAM SOP Section 10. The barometric pressure transfer standards will be calibrated annually according to AAM SOP Section 10.

Monitor temperature sensors will be calibrated in the field initially and every 12 months following AAM SOP Section 9. Monitor temperature sensors will have a one point check (verification) every month following AAM SOP Section 9.

Monitor barometric pressure sensors will be calibrated in the field initially and every 12 months following AAM SOP Section 9. Monitor barometric pressure sensors will have a one point check (verification) every month following AAM SOP Section 9.

Monitor flow rate meters will be calibrated in the field initially and every 12 months following AAM SOP Section 9. Monitor flow rate meters will have a one point check (verification) every month following AAM SOP Section 9.

Monitor flow meters will be audited each calendar quarter following AAM SOP Section 9. Results of these audits will be submitted to EPA-AIRS following AAM SOP Section 4.

Preventive maintenance will be performed according to AAM SOP Section 9.

9.2 PM10 Intermittent Sampling

The flow rate transfer standards (orifices) will be calibrated annually following AAM SOP Section 10. The sampler flow rates will be calibrated every 6 months following AAM SOP Section 2. 25% (a minimum of one) of the PM10 monitors will be audited each quarter. All PM10 monitors will be audited during the calendar year. Audits will be performed according to AAM SOP Section 2. Results of all audits will be reported to EPA-AIRS following AAM SOP Section 4.

Preventive maintenance will be performed according to AAM SOP Section 2.

9.3 Continuous Gaseous Monitoring

9.3.1 Certification of Standards

Cylinders of known gas (CO and NO) will be traceable to either a National Institute of Standards and Technology (NIST) Traceable Reference Material (NTRM) or a NIST-certified Gas Manufacturer's Internal Standard (GMIS). This is done by using EPA Protocol Gases.

Permeation tubes used to obtain known gases (SO2 and NO2) will be traceable to either a NTRM or a NIST-certified GMIS. Traceability is certified according to EPA Traceability Protocol.

Ozone known concentrations are provided by Ultra-Violet (UV) photometers. A primary standard UV photometer is maintained by KDHE. Every 12 months, it is certified by comparing it to an EPA Region 7 UV photometer. Transfer standard UV photometers are used for quality control operations in the field. Whenever a transfer standard is used, it will have been certified against the primary standard within the previous three months.

More details on the certification of standards can be found in AAM SOP Section 10.

9.3.2 Calibrations

Calibration involves comparing the monitor to known concentrations of zero ppm, 0.03 to 0.08 ppm, 0.15 to 0.20 ppm, and 0.35 to 0.45 ppm (except CO, 3 to 8 ppm, 15 to 20 ppm, and 35 to 45 ppm). If necessary, adjustments are made for the zero point and the 35 to 45 ppm point. Calibrations are performed initially and every six months. When doing calibrations, AAM SOP Section 1 will be followed.

9.3.3 Zero and Span Checks

Zero and span checks (ZSC) are performed every two weeks according to AAM SOP Section 1. ZSC are used to validate data and, if needed, to adjust the monitors. The ZSC checks the monitor reading for a known of zero ppm and a known of 0.35 to 0.45 ppm (except CO 35 to 45 ppm). A span percent difference of greater than 25 percent causes data to the last valid span check to be invalidated. When a monitor runs for over five weeks without a ZSC or any quality control procedure, then the data since the last valid ZSC are invalidated.

9.3.4 Precision Check

Precision checks (PC) are performed every two weeks according to AAM SOP Section 1. PC are used as a check of the monitor at approximately the level of the National Ambient Air Quality Standard (NAAQS). PC are done prior to any adjustment of the monitor. PC are performed for a known of 0.08 to 0.10 ppm (except CO, 8 to 10 ppm). When doing PC, the known gases will pass through all filters, scrubbers, conditioners and other components used during normal sampling and as much of the ambient air inlet system as is practicable.

9.3.4 Audits

25% (a minimum of one) of the CO, 25% (a minimum of one) of the O3, 25% (a minimum of one) of SO2, and 25% (a minimum of one) of the NO2 monitors will be audited each calendar quarter. All monitors will be audited at least once during the calendar year. No adjustment will be made to the monitor on the same day prior to the audit. Audits will be performed following AAM SOP Section 1. Different known gaseous standards are used for the audit than for other quality control operations. The audit known gaseous standards are in the same concentration ranges as for calibrations (see section 9.3.2 above).

9.3.5 Preventive Maintenance

Preventive maintenance is performed following AAM SOP Section 1.

9.4 PM10/PM2.5 Continuous Monitoring

9.4.1 Certification of Standards

The standard used for flow rate checks is the Dry Cal DC-2 Flow Calibrator manufactured by BIOS International Company. This is considered a primary standard.

9.4.2 Calibrations

Calibrations will be performed initially and every six months following the AAM SOP Section 16.

9.4.3 Precision Checks

Precision checks will be performed every two weeks following AAM SOP Section 16.

9.4.4 Audits

25 percent (at least one) of the PM10/PM2.5 continuous monitors will be audited each calendar quarter. Every monitor will have at least one audit per calendar year. A different flow standard will be used for audits than is used for other quality control procedures. Audits will be performed following AAM SOP Section 16.

9.4.5 Preventive Maintenance

Preventive maintenance will performed following AAM SOP Section 16.

Section 10

PURCHASED EQUIPMENT

10.1 Purchased Equipment

This section provides a description of inspection procedures and acceptance requirements for purchased equipment and supplies.

AAM SOP Section 14 will be followed.

Section 11

EVALUATION PROCEDURES

This section contains a description of procedures (including statistical procedures) used to evaluate data precision, accuracy, completeness, representativeness and comparability, including a detailed characterization of internal QC procedures and external performance audit requirements.

11.1 Calculation Procedures

Section 3 above contains the data performance criteria used for evaluation of data. Those criteria use the percent difference (PD) quite often. For precision calculations on collocated data (monitors located at the same site), the PD is found by the following formula:

$$PD = \frac{Y - X}{(Y + X)/2} \times 100$$

Where Y is the duplicate sampler concentration and X is the regular sampler concentration.

For all other calculations in section 3 above, the PD is found by the following formula:

$$PD = \frac{Y - X}{X} \times 100$$

Where Y is the known concentration (or flow) and X is the monitor concentration (or flow).

Percent completeness (PC) (criteria are described in section 3 above) is found by using the following formula:

$$PC = \frac{NV}{NT} \times 100$$

Where NV is the number of valid samples and NT is the number of theoretical (scheduled) samples.

11.2 Evaluation of Internal QC Activities

For precision and accuracy, evaluate the results following the procedures in section 3 above.

For zero/span checks, this procedure is followed:

(1) For a span absolute value of the percent difference (APD) of greater than 15 percent, perform a multi-point calibration of the monitor. For a span APD of greater than 25 perecent invalidate data back to the last valid quality control activity.

(2) For an absolute value of the zero reading (AZR) greater than .025 ppm for O3, SO2, NO2, and H2S, perform a multi-point calibration of the monitor. For an AZR of greater than 2.5 ppm for CO, perform a multi-point calibration of the monitor.

In cases where there are missing bi-weekly span checks, these validation rules will be followed:

(1) More than one span check missing, causes invalidation back to the last (less than 16 percent difference) span check.
(2) A span check from 16-25 percent difference (with no recalibration), counts as missing.
(3) An audit or calibration (with the span point less than 16 percent difference) counts as a good span check.
(4) A good span check that is greater than 5 weeks after or before any other span checks does not validate any data.

11.3 Evaluation of External Audits

KDHE will participate in the EPA National Performance Audit Program (NPAP). PM2.5 collocated Federal Reference Method (FRM) audits will be performed by an EPA contractor. It is anticipated that EPA Region 7 will perform various monitor audits. KDHE will cooperate in all applicable EPA audits. Any external audits with a percent difference greater than 15 percent (4 percent for PM2.5 filter monitor flow audit and 10 percent for PM10 filter monitor flow audit) will be investigated and corrective action will be taken.

Section 12

SPECIAL TREATMENT OF DATA

12.1 Special Treatment of Data

This section describes procedures used to evaluate and enhance utility of environmental monitoring data including, but not necessarily limited to, procedures and assumptions applied in the identification and treatment of (a) outliers and other anomalous data, (b) nonlinear data requiring statistical transformation, and (c) values reported as “less than” or “greater than” established reporting limits**.**

In those cases where filter net weights are less than zero, these samples are considered invalid.

In those cases where continuous monitors record concentrations less than zero, these concentrations are reported as zero.

Except for the above, there will be no other special treatment of data.

Section 13

CORRECTIVE ACTIONS

13.1 Corrective Actions

Section 15 of the Ambient Air Monitoring Standard Operating Procedures (AAM SOP) describes corrective actions that are taken due to problems including quality control results which indicate problems as described in sections 8, 9, and 11 above.

Section 14

QUALITY OF ACQUIRED DATA

14.1 Quality of Acquired Data

This section describes procedures for determining the quality of ancillary data acquired from external sources not subject to the provisions of the KDHE Division of Environment Quality Management Plan (e.g., meteorological, hydrological, geological, chemical and/or biological data obtained from other state and federal agencies).

The Air Monitoring Services Section acquires meteorological data (MD) from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC). The data acquired are the unedited local climatological data**.**

The MD are used to correlate air quality pollution data with source emission data. The MD are also used to analyze long range transport of air pollution. The MD are also used to convert PM10 or PM2.5 concentrations reported in standard conditions of temperature and pressure to concentrations reported in local conditions of temperature and pressure. Details of this procedure are in Section 4 of AAM SOP.

The NCDC estimate that the MD have an error rate of less than one percent.

Section 15

REPORTS

15.1 Reports

This section contains a description of program/project deliverables (electronic databases, summary statistics, illustrative materials, interim and final reports, etc.) and schedule for completion.

Hourly and daily concentration data are reported to the EPA Aerometric Information and Retrieval System (AIRS) on a quarterly basis. A calendar quarter's data is submitted within 90 days of the end of the quarter. An EPA edit has to be passed before the data are accepted by AIRS. The EPA program SCAN is also run in order to verify the data further. Prior to any submission of concentration data to AIRS, all applicable monitor and site information is submitted to AIRS.

Precision and accuracy data are reported to the EPA AIRS on a quarterly basis. A calendar quarter's data is submitted within 90 days of the end of the quarter. An EPA edit has to be passed before the data are accepted by AIRS.

A SLAMS annual report is submitted to EPA Region 7 and EPA Headquarters. This report covers the calendar year and is submitted by 30 June following the year. This report gives a summary of SLAMS, PM2.5 and PM10 monitoring data.

An ambient air monitoring network report is submitted to EPA Region 7 by 30 June of each year. This report provides the results of a network review and what changes are planned in the immediate future.

A Kansas air quality report will be published each year. This report provides information to the general public on air pollution activities and trends.

A quality assurance program evaluation of the air monitoring program is conducted covering the calendar year. This report is submitted to the Division of Environment QA Officer by 15 February of each year. The Air Monitoring Services Section Chief directs this evaluation.

During the ozone season, ozone monitoring data (not quality assured) are submitted to EPA. The data are submitted circa the tenth of the month for the previous month's data.

As short term special projects are completed, a project report is prepared that summarizes the activities and results of the air monitoring of the project.

For those ozone monitors that report real-time data to the ozone mapping system (OMS), data is transmitted to OMS during the ozone season (April 1 through October 31). Polling times for

OMS are 7 a.m., 11 a.m., 1 p.m., 3 p.m., 5 p.m., 7 p.m., and 9 p.m. Central Standard Time (CST). These data are preliminary and have neither been examined nor approved for quality control compliance.

Section 16

TRAINING

16.1 Training

Personnel will meet the educational, work experience, responsibility, and training requirements for their positions. Records on personnel qualifications and training will be maintained in personnel files.

On-the-job training is an important part of the training program. For this, an employee reads and studies all relevant material (e.g., operator's manual, SOPs, federal regulations, and QA manuals) before performing an operation. Then the employee performs the operation while being observed by an experienced technician. When the experienced technician is satisfied that the employee is doing the operation correctly, the employee then may do the operation independently.

More detailed training procedures are given in Section 5 of AAM SOP.

Any conferences or workshops on air monitoring will be attended if funding can be arranged. Usually only one person attends these (he/she relays the information to applicable personnel after returning to the office) in order to conserve resources.

Several satellite downlinks on air monitoring are available in the office. These are attended by air monitoring personnel.

Over the years, a number of courses have been developed for personnel involved with ambient air monitoring and quality assurance aspects. Formal QA/QC training is offered through the following organizations:

- Air Pollution Training Institute (APTI) *http://www.epa.gov/oar/oaq.apti.html*
- EPA Office of Air Quality Planning and Standards (OAQPS) *http://www.epa.gov/oar/oaqps*
- Air & Waste Management Association (AWMA) *http://awma.org/epr.htm*
- American Society for Quality Control (ASQC) *http://www.asqc.org/products/educat.html*
- EPA Institute
- EPA Quality Assurance Division (QAD) *http://es.inel.gov/ncerqa/qa/*
- EPA Regional Offices

The following table presents a sequence of core ambient air monitoring and QA courses for ambient air monitoring staff, and QA managers (marked by asterisk). The suggested course sequences assume little or no experience in QA/QC or air monitoring. Persons having experience in the subject matter described in the courses would select courses according to their appropriate experience level. Courses not included in the core sequence would be selected according to individual responsibilities, preferences, and available resources.

Core Ambient Air Training Courses

Sequence	Course Title (SI = self instructional)	Number	Source
1*	Air Pollution Control Orientation Course (Revised)	SI:422	APTI
2*	Principles and Practices of Air Pollution Control	452	APTI
3*	Orientation to Quality Assurance Management		QAD
4*	Introduction to Ambient Air Monitoring (Under Revision)	SI:434	APTI
5*	General Quality Assurance Considerations for Ambient Air Monitoring (Under Revision)	SI:471	APTI
6*	Quality Assurance for Air Pollution Measurement Systems (Under Revision)	470	APTI
7*	Data Quality Objectives Workshop		QAD
8*	Quality Assurance Project Plan		QAD
9	Atmospheric Sampling (Under Revision)	435	APTI
10	Analytical Methods for Air Quality Standards	464	APTI
11	Chain-of-Custody Procedures for Samples and Data, SI	443	APTI
*	Data Quality Assessment		QAD
*	Management Systems Review		QAD
*	Beginning Environmental Statistical Techniques (Revised)	SI:473A	APTI
*	Introduction to Environmental Statistics	SI:473B	APTI
*	Quality Audits for Improved Performance		AWMA
*	Statistics for Effective Decision Making		ASQC
	AIRS Training		OAQPS
*	FRM Performance evaluation Training (field/lab)		OAQPS
*	$PM_{2.5}$ Monitoring Implementation (Video)		OAQPS

* Courses recommended for QA Managers